



1999–2000 CATS ASSESSMENT

Open-Response Item Scoring Worksheet

Grade 4 – Science

The **academic expectation** addressed by the open-response item “Earth Materials” is

- 2.3 Systems and Interactions – Students identify and analyze systems and the ways in which their components work together or affect each other.

The **core content** addressed by this item includes:

- SC-E-3.1.2 Organisms have basic needs. For example, animals need air, water, and food; plants need air, water, nutrients, and light. Organisms can survive only in environments in which their needs can be met.
- SC-E-2.1.1 Earth materials include solid rocks and soils, water, and the gases of the atmosphere. Materials that make up rocks have properties of color, texture, and hardness. Soils have properties of color, texture, the capacity to retain water, and the ability to support plant growth. Water on Earth and in the atmosphere can be a solid, liquid or gas.

Earth Materials

Some of Earth’s materials are:

- soil
 - water
 - gases of the atmosphere
- a. Choose TWO materials from the list above. Explain how a PLANT uses these materials to live.
- b. Choose TWO materials from the list above. Explain how an ANIMAL uses these materials to live.



SCORING GUIDE

Grade 4 Science

| Score | Description |
|-------|---|
| 4 | The response is complete and shows a strong understanding of how plants and animals use Earth materials to live. The response clearly and accurately explains how plants and animals each use two Earth materials. |
| 3 | The response shows an understanding of how plants and animals each use Earth materials to live. The response explains how plants and animals each use two Earth materials. The response may lack detail or may contain minor errors or misconceptions. |
| 2 | The response shows a limited understanding of how plants and animals use Earth materials to live. The response explains how at least one Earth material is used by a plant and an animal. There may be errors, misconceptions, and omissions. OR Student explains how a plant or an animal uses two of the listed materials to live. The response may include minor errors or misconceptions. |
| 1 | The response is incomplete and shows minimal understanding of how plants and animals use Earth materials to live. There may be an attempt to explain how one or more materials are used, but the response contains major errors, misconceptions, and omissions. |
| 0 | Response is totally incorrect or irrelevant. |
| Blank | No response. |

Science Behind the Question:

Plants use rocks and soil as a place to anchor the plant with their roots, and take in water and minerals stored in the soil. Plants also take in water from the soil and the atmosphere which is needed for turgor pressure, photosynthesis, and respiration. Carbon dioxide gas from the atmosphere is used for photosynthesis and oxygen is used for cellular respiration.

Animals need water for cell functions such as respiration, and oxygen from the atmosphere for respiration. Animals also need minerals found in rocks, soil and plants.



ANNOTATED STUDENT RESPONSE

Grade 4 Science

Sample 4-Point Response of Student Work

Student Response

A plant uses water to live, because water is the key to all life forms. Water is one ingredient to a plant's food source. It gives the plant minerals and nutrients the plant needs. And when you see green on a plant, you're really seeing chlorophyll that the water had a part in making.

Plants also use soil to live, because the soil has nutrients and minerals that the plant uses. The soil gives off some moisture if it is near a water source or after a rainfall. The soil also holds the roots in to help it stand up. Some animals use soil to survive. Some animals store their food in the ground. And in winter some animals hibernate in the ground. Small animals, like lizards, camouflage themselves from predators. Some go into a hole to protect themselves.

Animals use water to gather some nutrients and minerals. Fresh water can keep them healthy. Water can give them stronger bones. That's what animals and humans need.

Student clearly and accurately explains how a plant uses water and soil to live (e.g., water helps provide the plant with minerals and nutrients; soil helps hold a plant's roots).

Student clearly and accurately explains how an animal uses soil and water to live (e.g., some animals store food in the ground and some animals go into a hole in the ground to protect themselves; animals get some nutrients and minerals from water).

Overall, the student shows a strong understanding of how plants and animals use some of Earth's materials to live. Student chooses two of the Earth materials listed (i.e., water and soil) and clearly and accurately explains how plants and animals use these materials to live.



ANNOTATED STUDENT RESPONSE

Grade 4 Science

Sample 4-Point Response of Student Work

Student Response

The two materials that a plant uses are soil and water. The soil helps hold the plant down. It also is used to get nutrients from the ground. Water is for the plant to help make its own food.

The two materials that an animal uses are water and soil. Soil is used for shelter by some animals. Water is to help animals cool down. Water is also used for getting a drink so they don't dehydrate.

← Student clearly and accurately explains how a plant uses soil and water to live (i.e., soil helps hold the plant down and provides the plant with nutrients; water is used by the plant to help it make its own food).

← Student clearly and accurately explains how an animal uses soil and water to live (e.g., soil is used for shelter by some animals; water is used by animals to help them cool down).

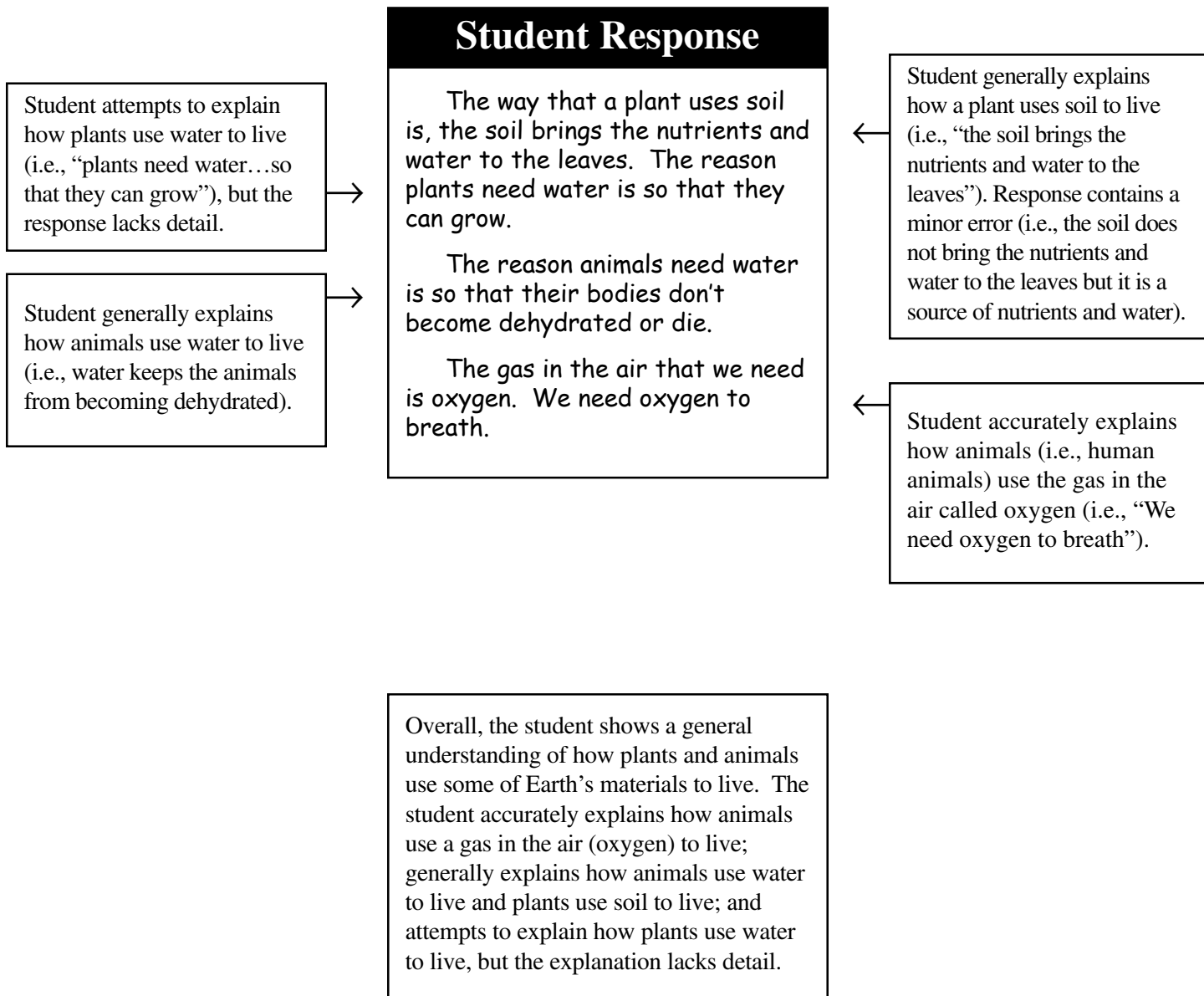
Overall, the student shows a strong understanding of how plants and animals use some of Earth's materials to live. Student chooses two of the Earth materials listed (i.e., soil and water) and clearly and accurately explains how plants and animals use these materials to live.



ANNOTATED STUDENT RESPONSE

Grade 4 Science

Sample 3-Point Response of Student Work





ANNOTATED STUDENT RESPONSE

Grade 4 Science

Sample 2-Point Response of Student Work

Student Response

Plants use water to grow and produce sugar so they will have food.

Plants use soil to put their roots in the ground to hold it in their place.

Animals need water to survive. They need soil to step on.

← Student clearly explains how plants use water to live (i.e., water helps plants produce sugar, the plants' food).

← Student clearly explains how plants use soil to live (i.e., soil helps plants hold in place through their roots).

← Student attempts to explain how animals use water and soil to live, but the explanation is limited.

Overall, the student shows some understanding of how plants and animals use some of Earth's materials to live. The student clearly explains how plants use water and soil to live, and provides a limited explanation of how animals use water and soil to live.



ANNOTATED STUDENT RESPONSE

Grade 4 Science

Sample 1-Point Response of Student Work

Student Response

plants need soil and water to live because they will grow up to be a big plant because of soil and water. soil helps plants to grow. water helps the plants grow too.

Grass and water helps Animal live by giving Animals eat and brink because if animals don't eat and brink they will bie. thats why animals needs to eat and brink.



Student attempts to explain how plants use soil and water to live but the response is incomplete (i.e., the response does not tell how the plants use soil and water to live).



Student generally explains how animals use water to live (i.e., animals drink water to stay alive).

Overall, the student shows a minimal understanding of how plants and animals use some of Earth's materials to live. The student correctly explains that animals drink water and that if they do not drink water, they will die.



INSTRUCTIONAL STRATEGIES

Grade 4 Science

The open-response item **“Earth Materials”** was designed to address students’ (1) ability to identify and analyze systems and the ways in which their components work together or affect each other, and (2) understanding of organisms’ dependence on and utilization of their environments. The instructional strategies below present ideas for helping students explore and master these concepts and skills.

Discuss the following concepts:

- Earth materials include solid rocks and soil, water, and gases of the atmosphere.
- Organisms have basic needs.
- Animals need air, water, and food.
- Plants need air, water, nutrients, and light.
- Organisms can only survive in environments in which their basic needs are met.
- Organisms use Earth materials to fulfill basic needs.
- Earth materials provide many resources for organisms, including humans.

Provide opportunities for students to work individually, in pairs, in small groups, and/or as a class to complete (with teacher guidance and support) any or all of the following activities:

- Explore the composition of different types of sands, soils, and rocks. Use simple tools (e.g., hand lens) to investigate properties of Earth materials. Sort and classify the materials by property and provide a rationale for the classification system.
- Research Earth materials that make up different geographic areas or regions of Earth. Compare these to Earth materials found in different Kentucky regions. Create presentations to explain how Kentucky’s resources compare to resources from other states.
- Walk around the school property and observe how Earth materials are used in constructing different structures (e.g., buildings, play equipment, parking areas). Record observations. Create posters to show how humans use Earth materials.
- Research various Earth materials (e.g., soil, rocks, minerals). Distinguish between rocks and minerals. Develop charts summarizing how Earth materials are formed, where they are found, and how they are used. Role play the formation and use of various Earth materials.



INSTRUCTIONAL STRATEGIES

Grade 4 Science

- Set up terrestrial and aquatic living systems. Record observations of interactions between living and nonliving parts of the systems. Construct models, draw diagrams, or prepare presentations to show how animals and plants use Earth materials to live.
- Visit different ecosystems (e.g., stream, pond, field, forest). Record observations of interactions between living and nonliving parts of the different ecosystems. Compare observations for each ecosystem. Draw diagrams to show how animals and plants in these ecosystems use Earth materials to live.
- Plant seeds in different types of Earth materials (e.g., sand, clay, vermiculite, soil). Record observations and compare growth of plants in different types of soil.
- Grow plants from seeds in different light conditions (e.g., window sill, closet). Record observations and compare growth of plants.
- Grow plants from seeds in different moisture conditions. Record observations and compare growth of plants.
- Create posters or presentations on the basic needs of plants and how plants use Earth materials to live.
- Observe classroom animals, and keep a journal of feeding, watering, and cleaning of environments. Create brochures on the care of pets, including the basic needs of animals and how animals use Earth materials to live.